IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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In re Application of

Ryuichi ISHII et al. Group Art Unit: 1742

Serial No. 09/725,234 Examiner: SIKYIN IP

Filed: November 29, 2000

For: HEAT-RESISTING STEEL, METHOD FOR THERMALLY TREATING HEAT-RESISTING STEEL, AND COMPONENTS MADE OF HEAT-RESISTING STEEL

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Honorable Commissioner of Patents and Trademarks
United States Patent and Trademark Office
PO Box 1450
Alexandria, Virginia 22313-1450

Sir:

DECLARATION UNDER 37 CFR 1.132

I, Ryuichi Ishii, the undersigned, a citizen of Japan and a resident of 4-11-15, Chuo, Edogawa-ku, Tokyo, Japan, do hereby declare that:

1. I am one of the co-inventors of the invention described in the above-identified patent application entitled "HEAT-RESISTING STEEL, METHOD FOR THERMALLY TREATING HEAT-RESISTING STEEL, AND COMPONENTS MADE OF HEAT-RESISTING STEEL" which was given United States Serial No. 09/725,234,

and accordingly I am familiar with the content of the present application.

2. I graduated from Tokyo Institute of Technology, Faculty of Engineering, Department of Metallurgy in March 1989, and finished the Master's Course, Tokyo Institute of Technology, in March 1991.

3. Since April 1991, I have been employed by KABUSHIKI KAISHA TOSHIBA, assignee of the above-identified application, where I have been engaged in research and development of steels, especially heat-resisting steels, in Metals and Ceramics Technology Group of said KAISHA.

4. In order to establish the patentability of the present invention, I would like to submit additional experimental data to prove that the upper limit of the carbon content, i.e., 0.30% by weight, and the lower limit of the tungsten content, i.e., 1.5% by weight, in the steels of the present invention are of great significance in attaining an excellent balance of the tensile strength, creep rupture time, and absorbed energy. The particulars are as follows.

EXPERIMENT 1

Comparison between Steels Having Different Carbon Contents

Steel P1A was prepared in the following manner as a steel having a composition similar to that of steel P1 of Example 1 of the specification, except for the carbon content.

30 kg of a sample steel was subjected to vacuum induction fusion, and then to casting. The cast ingot was forged at a high temperature, annealed, and then normalized. This ingot was subjected to oil hardening, followed by tempering. Thus, steel P1A was obtained. The composition of steel P1A is shown in Table 1. For comparison, Table 1 also shows the composition of steel P1 of Example 1 of the specification, which falls within the scope of independent claim 21. Both of these heat-resisting steels have been controlled to have a tensile strength of approximately 750 MPa as described in Example 1 in the specification.

As shown in Table 1, steel P1A has a composition similar to that of steel P1 of the present invention, except for whether or not the carbon content is less than 0.30% by weight, which is the upper limit defined in independent claims 21 to 26.

Table 1

	C	Si	Mn	Cr	V	W	Ti	Nb	N	B
P1	0.28	0.07	0.49	2.22	0.16	1.61	0.012	0.06	0.011	0.005
P1A	0.32	0.06	0.48	2.19	0.16	1.58	0.014	0.06	0.012	0.005

(% by weight)

Steel P1A was subjected to a tensile test, a creep rupture test and a Charpy impact test in the same manner as in Example 1 of the specification. Specifically, the tensile strength at room temperature (MPa), the creep rupture time at 600°C under 196 MPa, and the absorbed energy at 20°C were measured. The results are shown in Table 2. For comparison, Table 2 also shows the results of steel P1.

Table 2

	Tensile Strength at Room Temperature (MPa)	Creep Rupture Time at 600°C- under 196 MPa (h)	Absorbed Energy at 20°C (J)
P1	764	887	163
P1A	759	716	112

The data in Table 2 indicates that steel P1A, which contains 0.32% by weight of carbon, has a shorter creep rupture time and less absorbed energy, compared to steel P1 containing 0.28% by weight of carbon.

EXPERIMENT 2

Comparison between Steels Having Different Tungsten Contents

Steel P5A was prepared in the following manner as a steel having a composition similar to that of steel P5 of Example 1 of the specification, except for the tungsten content.

30 kg of a sample steel was subjected to vacuum induction fusion, and then to casting. The cast ingot was forged at a high temperature, annealed, and then normalized. This ingot was subjected to oil hardening, followed by tempering. Thus, steel P5A was obtained. The composition of steel P5A is shown in Table 3. For comparison, Table 3 also shows the composition of steel P5 of Example 1 of the specification, which falls within the scope of independent claim 24. Both of these heat-resisting steels have been controlled to have a tensile strength of approximately

750 MPa as described in Example 1 in the specification.

As shown in Table 3, steel P5A has a composition similar to that of steel P5 of the present invention, except for whether or not the tungsten content is more than 1.5% by weight, which is the lower limit defined in independent claims 21 to 26.

Table 3

	C	Si	Mn	Cr	V	W	Mo	Ti	Nb	N	B
P5	0.27	0.06	0.42	2.28	0.18	1.59	0.78	0.020	0.03	0.022	0.006
P5A	0.28	0.06	0.48	2.25	0.19	1.47	0.75	0.019	0.04	0.025	0.005

(% by weight)

Steel P5A was subjected to a tensile test, a creep rupture test and a Charpy impact test in the same manner as in Example 1 of the specification. Specifically, the tensile strength at room temperature (MPa), the creep rupture time at 600°C under 196 MPa, and the absorbed energy at 20°C were measured. The results are shown in Table 4. For comparison, Table 4 also shows the results of steel P5.

Table 4

	Tensile Strength at Room Temperature (MPa)	Creep Rupture Time at 600°C- under 196 MPa (h)	Absorbed Energy at 20°C (J)
P5	770	1508	92
P5A	760	845	125

The data in Table 4 indicates that steel P5A, which contains 1.47% by weight of tungsten, has a shorter creep rupture time, compared to steel P5 containing 1.59% by weight of tungsten.

I further declare that all statements herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: February 25, 2004

Ryuichi Ishii

Ryuichi ISHII